

CLAIMS

1. A method of creating a turbine brush seal, comprising:

applying a bonding agent to at least one member, wherein the bonding agent maintains bonding properties at temperatures above at least a minimum temperature for at least a minimum time; and

embedding a plurality of flexible filaments into the bonding agent to create the turbine brush seal, wherein the plurality of flexible filaments are capable of sustaining temperatures above at least the minimum temperature for at least the minimum time;

wherein the minimum temperature comprises about 400° C, and wherein the minimum time comprises about 10,000 hours.

2. The method of claim 1, further comprising creating at least one groove in the at least one member, and wherein the applying comprises applying the bonding agent within the at least one groove.

3. The method of claim 2, wherein creating the at least one groove comprises creating the at least one groove with at least two different depths.

4. The method of claim 1, wherein the turbine brush seal is installed in a machine between a rotating member and a stationary member, and wherein the at least one member comprises at least one of the rotating member and the stationary member.

5. The method of claim 1, wherein the turbine brush seal is installed in a machine between a first member and a second member, wherein the at least one member comprises at least one of the first member and the second member, and wherein each of the first member and the second member is one of a rotating member and a stationary member.

6. The method of claim 1, wherein applying the bonding agent comprises applying a molten material to the at least one member.

7. The method of claim 6, wherein applying the molten material comprises applying a molten ceramic material.

8. The method of claim 6, wherein applying the molten material comprises applying a molten metal.

9. The method of claim 8, further comprising, prior to applying the molten metal, applying a material in at least one area of the at least one groove where an absence of the plurality of filaments is desired to prevent the molten metal from bonding to the at least one member in the at least one area.

10. The method of claim 8, wherein the embedding comprises electrostatically flocking.

11. The method of claim 1, wherein the plurality of flexible filaments are coated to alter the electrical resistivity thereof.

12. The method of claim 1, wherein applying the bonding agent comprises rotating the at least one member.

13. The method of claim 1, wherein each of the plurality of flexible filaments has an electrical resistivity of about 10^8 ohms to about 10^{10} ohms.

14. The method of claim 1, further comprising repositioning at least some of the plurality of flexible filaments before the bonding agent solidifies.

15. The method of claim 14, wherein repositioning comprises angling the at least some of the plurality of flexible filaments with respect to a normal out of a surface of the at least one member.

16. The method of claim 1, wherein the turbine brush seal is installed on a machine, the method further comprising coupling the at least one member to the machine.

17. The method of claim 16, further comprising creating at least one groove in the machine, and wherein the coupling comprises placing the at least one member in the at least one groove.

18. The method of claim 1, wherein the bonding agent comprises an additive to reduce capillary action.

19. The method of claim 1, wherein the embedding comprises electrostatically flocking.

20. The method of claim 19, wherein the turbine brush seal is installed in a machine between a first member and a second member, wherein the at least one member comprises at least one of the first member and the second member, and wherein the electrostatically flocking comprises electrostatically flocking at least one flexible filament sized longer than a space between the first member and the second member prior to the startup of the machine.

21. The method of claim 1, wherein the minimum temperature comprises about 500° C.

22. The method of claim 1, wherein the minimum temperature comprises about 600° C.

23. The method of claim 1, wherein at least one of the plurality of flexible filaments has a cross-sectional shape of an n-point star, wherein n is at least 3.

24. The method of claim 23, wherein at least one arm of the n-point star is pointed.

25. The method of claim 23, wherein at least one arm of the n-point star is blunted.

26. The method of claim 23, wherein at least one arm of the n-point star is radiused.

27. The method of claim 1, wherein the bonding agent has a remelt point above a maximum running temperature of the turbine brush seal.

28. A turbine brush seal, comprising:
 - at least one member;
 - a bonding agent on a surface of the at least one member, wherein the bonding agent maintains bonding properties at temperatures above at least a minimum temperature for at least a minimum time;
 - a plurality of flexible filaments embedded in the bonding agent creating the turbine brush seal, wherein the plurality of flexible filaments are capable of sustaining temperatures above at least the minimum temperature for at least at least the minimum time; and

wherein the minimum temperature comprises about 400° C, and wherein the minimum time comprises about 10,000 hours.
29. The turbine brush seal of claim 28, wherein there is an absence of sealing rings coupling the plurality of flexible filaments to the at least one member.
30. The turbine brush seal of claim 28, wherein the at least one member is part of a machine.
31. The turbine brush seal of claim 30, wherein the at least one member comprises at least one groove, and wherein the bonding agent resides in the groove.
32. The turbine brush seal of claim 31, wherein the at least one groove comprises at least two different depths.
33. The turbine brush seal of claim 30, wherein the turbine brush seal is installed in a machine between a first member and a second member, wherein the at least one member comprises at least one the first member and the second member, and wherein each of the first member and the second member is one of a rotating member and a stationary member.
34. The turbine brush seal of claim 28, wherein the turbine brush seal is for coupling to a machine, and wherein the at least one member is separate from the machine.

35. The turbine brush seal of claim 34, wherein the machine comprises at least one groove sized to fit the at least one member therein.

36. The turbine brush seal of claim 28, wherein the bonding agent comprises a material with a lower melting point than the plurality of flexible filaments.

37. The turbine brush seal of claim 36, wherein the bonding agent comprises a ceramic material.

38. The turbine brush seal of claim 36, wherein the bonding agent comprises a molten metal.

39. The turbine brush seal of claim 28, wherein the turbine brush seal comprises at least one area having an absence of the plurality of flexible filaments.

40. The turbine brush seal of claim 28, wherein the plurality of flexible filaments are coated to alter the electrical resistivity thereof.

41. The turbine brush seal of claim 28, wherein the bonding agent comprises an additive to reduce capillary action.

42. The turbine brush seal of claim 28, wherein at least one of the plurality of flexible filaments is angled with respect to a normal out of the member.

43. The turbine brush seal of claim 28, wherein at least some of the plurality of flexible filaments are angled.

44. The turbine brush seal of claim 28, further comprising at least one backer on the member for supporting at least some of the plurality of flexible filaments.

45. The turbine brush seal of claim 28, wherein the turbine brush seal is installed in a machine between a first member and a second member, wherein the at least one member comprises at least one of the first member and the second member, and wherein at least one of the plurality of flexible filaments is sized longer than a space between the first member and the second member prior to startup of the machine.

46. The turbine brush seal of claim 28, wherein each of the plurality of flexible filaments has an electrical resistivity of about 10^8 ohms to about 10^{10} ohms.

47. The turbine brush seal of claim 28, wherein the minimum temperature comprises about 500° C.

48. The turbine brush seal of claim 47, wherein the minimum temperature comprises about 600° C.

49. The turbine brush seal of claim 28, wherein at least one of the plurality of flexible filaments has a cross-sectional shape of an n-point star, wherein n is at least 3.

50. The turbine brush seal of claim 49, wherein at least one arm of the n-point star is pointed.

51. The turbine brush seal of claim 49, wherein at least one arm of the n-point star is blunted.

52. The turbine brush seal of claim 49, wherein at least one arm of the n-point star is radiused.

53. The turbine brush seal of claim 28, wherein the bonding agent has a remelt point above a maximum running temperature of the turbine brush seal.

54. A system for creating a turbine brush seal, comprising:

a bonding agent for applying to at least one member, wherein the bonding agent maintains bonding properties at temperatures above at least a minimum temperature for at least a minimum time;

a plurality of flexible filaments, wherein the plurality of flexible filaments are capable of sustaining temperatures above at least the minimum temperature for at least the minimum time; and

a machine for embedding the plurality of flexible filaments into the bonding agent to create the turbine brush seal;

wherein the minimum temperature comprises about 400° C, and wherein the minimum time comprises about 10,000 hours.

55. The system of claim 54, wherein the bonding agent comprises a molten material.

56. The system of claim 55, wherein the molten material comprises a molten metal.

57. The system of claim 55, wherein the molten material comprises a molten ceramic material.

58. The system of claim 54, further comprising a material for applying in at least one area of the at least one member on which the bonding agent is to be applied where an absence of the plurality of flexible filaments is desired to prevent the bonding agent from bonding to the at least one member in the at least one area.

59. The system of claim 54, wherein the plurality of flexible filaments are coated to alter the electrical resistivity thereof.

60. The system of claim 54, wherein the bonding agent comprises an additive to reduce capillary action.

61. The system of claim 54, further comprising an angle adjustment tool for angling the plurality of flexible filaments after embedding within the bonding agent and before the applied bonding agent solidifies.

62. The system of claim 54, wherein the machine comprises an electrostatic flocking machine.
63. The system of claim 62, wherein the electrostatic flocking machine comprises:
 - a flocking gun;
 - a compressor; and
 - a hopper for holding the plurality of flexible filaments.
64. The system of claim 63, wherein the electrostatic flocking machine further comprises a power supply for producing a potential difference between the flocking gun and the at least one member.
65. The system of claim 54, wherein each of the plurality of flexible filaments has an electrical resistance of about 10^8 ohms to about 10^{10} ohms.
66. The system of claim 54, wherein the minimum temperature comprises about 500° C.
67. The system of claim 66, wherein the minimum temperature comprises about 600° C.
68. The system of claim 54, wherein the plurality of flexible filaments comprises at least one flexible filament having a cross-sectional shape of an n-point star, and wherein n is at least 3.
69. The system of claim 68, wherein at least one arm of the n-point star is pointed.
70. The system of claim 68, wherein at least one arm of the n-point star is blunted.
71. The system of claim 68, wherein at least one arm of the n-point star is radiused.
72. The system of claim 54, wherein the bonding agent has a remelt point above a maximum running temperature of the turbine brush seal.

73. A flexible filament for a turbine brush seal having a cross-sectional shape of an n-point star, wherein n is at least 3, wherein the flexible filament is capable of sustaining temperatures of at least a minimum temperature for at least about 10,000 hours, and wherein the minimum temperature is about 400° C.

74. The flexible filament of claim 73, wherein at least one arm of the n-point star is pointed.

75. The flexible filament of claim 73, wherein at least one arm of the n-point star is blunted.

76. The flexible filament of claim 73, wherein at least one arm of the n-point star is radiused.

77. The flexible filament of claim 73, wherein the minimum temperature is about 500° C.

78. The flexible filament of claim 71, wherein the minimum temperature is about 600° C.